

### REMARKS

Applicant has carefully reviewed and considered the Office Action mailed on March 24, 2003, and the references cited therewith.

Claims 1, 2, 4-6, 31, 42-43, 45-48, and 50-53 are amended; as a result, claims 1, 2, 4-6, 31, 33-36, and 38-54 are now pending in this application. No new matter was added by these amendments. Support for amendment of claims 1, 31, 42-43, 45-48, and 50-53 comes from the Specification at page 7 and throughout the disclosure.

### §112 Rejection of the Claims

Claims 1, 2, 4-6, 31, 33-36, and 38-54 were rejected under 35 USC § 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The Applicant respectfully traverses the rejection and requests the Office to consider the following.

The assertions in the Office Action are mistaken. The Office Action asserts that "[t]he specification, on the other hand, only supports not illuminating the substrate surface, which *excludes* indirect exposure of the substrate to the light source." (Office Action at page 3, emphasis in original). Applicant directs the Office to the specification at page 6, line 3-6, where it states,

The source of light should be of a high intensity nature and can be supplied by any appropriate source, preferably in the present example, an array of mercury arc vapor lamps positioned to uniformly illuminate the reaction surface of the substrate.

Thus, the Office Action is mistaken. Applicant notes, incidentally, the phrase "positioned to uniformly illuminate the reaction surface of the substrate" does not exclusively imply to directly illuminate the reaction surface.

Applicant notes the Specification at page 7, lines 15-17 refers to a portion of the "reaction volume" of the gases. That portion is "[t]he reaction volume of the gases that is exposed to optical excitation in this process [that] is meant to describe the volume of gas located within a chemically reactive distance of the substrate." (Specification at page 7, lines 15-17). Consequently, some of the "reaction volume" impliedly is exposed to

optical excitation, but it is not located within a chemically reactive distance of the substrate.

Applicant further notes that the specification states at page 7, beginning at line 23 that "[i]t is not necessary to illuminate the gas volume in the rest of the CVD chamber or to illuminate the substrate surface." (Specification at page 7, lines 23-24). Applicant asserts that among these three statements taken from the Specification, Applicant's disclosure teaches uniform illumination of a reaction surface in one example, illumination of the reaction volume of the gases that is exposed to optical excitation, and that is not necessary to illuminate the gas volume in the rest of the CVD chamber or to illuminate the substrate surface. These teachings taken together enable the claim language "without directly exposing the substrate surface to the light source". Withdrawal of the rejections is respectfully requested.

Claims 45 and 50 were rejected under 35 USC § 112, first paragraph, as allegedly based upon a disclosure which is not enabling. The Office Action asserts that the cited claims must include "[o]zone or some oxygen source . . ." (Office Action at page 3). The Applicant respectfully traverses the rejection and requests the Office to consider the following.

The Office Action is mistaken. 35 USC § 112, first paragraph is typically directed to the body of the specification, not the appended claims. Applicant directs the Office to the specification at page 7. Ozone is recited at line 10. Claims 45 and 50 each include the term "comprising". Such claim language has been deemed to be open-ended. (MPEP 2111.03) Consequently, enabling teachings in the body of the specification, do not necessarily need to be placed in the claims. The Office Action is effectively asserting the claims, standing alone, must be enabling. This assertion is in error, and withdrawal of the rejections is respectfully requested.

Claims 1, 2, 4-6, 31, 33-36, and 38-54 were rejected under 35 USC § 112, first paragraph, because the specification, "while being enabling for a pressure on the order of 0.01 atmospheres (7.6 Torr), does not reasonably provide enablement for a pressure range of 200 to 760 Torr." (Office Action at pages 3 and 4). The Applicant respectfully traverses the rejection and requests the Office to consider the following.

The Office Action is mistaken. The Office Action goes far afield into a theory that is based upon fundamentally incorrect first principles. The Office Action asserts

The mean free path of a gas molecule is defined as the distance between collisions with other gas molecules or a surface and is given by the equation

$$\lambda = 5 \times 10^{-3}/P$$

where  $\lambda$  is the mean free path in cm (centimeters) and P is the pressure in Torr.

(Office Action at pages 4 and 5, citation to Ohring omitted). The Office is mistaken. Ohring explicitly states his equation is a *simple relation for ambient air*. The Office has failed to indicate the applicability of Ohring's relationship to systems in Applicant's disclosure. Withdrawal of the rejections is respectfully requested.

Applicant notes Ohring's relationship is not temperature dependent, and Applicant need not speculate whether the relationship is reliable for anything but ambient air. Consequently, it is perhaps no surprise that temperature is not in this relationship presented by Ohring. Withdrawal of the rejections is respectfully requested.

The Office Action has made no assertion regarding the exact relationship between mean free path lengths of reactant molecules and the wavelength of a given light. Such exact relationship should be asserted. Applicant believes the Office is asserting a specific mean free path length and an optical wavelength must have a proportional relationship or something like it in order to achieve a photon- initiated reaction. This assertion is a flawed for at least three reasons.

First, mean free path is an average. This means some free paths will be larger and some smaller. Even if the Office were to provide a credible relationship of mean free path with respect to temperature and pressure, it would not necessarily eliminate all paths between collisions that are greater or lesser than the mean. Withdrawal of the rejections is respectfully requested.

Second, the Office uses the teaching of Bowen (US 4,579,750). It is in doubt whether Bowen's teaching is germane to Applicant's claimed subject matter, namely, that the reactive gas molecules must be "within a few mean free path lengths of the gaseous

molecules" (Office Action at page 4). Bowen's system is devoid of any teaching of gas temperatures, and Bowen teaches the pressure of 0.1 atmospheres to be "relatively high". (Bowen at column 9, lines 22-30). This teaching is significantly removed from pressures of the claimed subject matter. Withdrawal of the rejections is respectfully requested.

Third, the Office implies that the Applicant has asserted "illumination of only the reaction volume without also illuminating the substrate surface at a pressure or (sic) 200 Torr to 760 Torr using (sic) while maintaining only heterogeneous reactions cannot happen. For this reason, the claims are not enabled." (Office Action at page 6).

Applicant again directs the Office to the Specification at page 7, wherein it states "[i]t is not necessary to illuminate the gas volume in the rest of the CVD chamber or to illuminate the substrate surface." (Specification at page 7, lines 23-24). This statement does not say the substrate surface is absolutely not illuminated. Withdrawal of the rejections is respectfully requested.

### **Drawings**

The Office asserts drawings are necessary to illustrate "wherein illumination of only the reaction volume, but not the substrate . . ." Applicant respectfully traverses this objection and requests the Office to consider the following.

Applicant respectfully requests the Office to point where Applicant has made an assertion that claimed subject matter includes an apparatus "wherein illumination of only the reaction volume [occurs], but not the substrate". (Office Action at page 6). This is an unfounded assertion by the Office.

Applicant notes the Specification refers to a portion of the "reaction volume" of the gases. That portion is "[t]he reaction volume of the gases *that* is exposed to optical excitation in this process [that] is meant to describe the volume of gas located within a chemically reactive distance of the substrate." (Specification at page 7, lines 15-17, emphasis added). Consequently, some of the "reaction volume" impliedly is exposed to optical excitation, but it is not located within a chemically reactive distance of the substrate. Withdrawal of the objection is respectfully requested.

**§103 Rejection of the Claims**

Claims 31, 33, 34, 38-40, 42, 51, and 52 were rejected under 35 USC § 103(a) as being unpatentable over Roche (U.S. Patent No. 4,581,248) in view of Hisanume (JP 02-050966) and considered with Bowen et al. (U.S. Patent No. 4,579,750). Applicant respectfully traverses this rejection and requests the Office to consider the following.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (M.P.E.P. § 2143 7<sup>th</sup> Ed).

In addition, the Federal Circuit has held that "If the examination at the initial stage does not produce a prima facie case of unpatentability, then without more the applicant is entitled to grant of the patent. *In re Oetiker*, 24 USPQ 2d 1443, 1444 (Fed. Cir. 1992). Applicant respectfully suggests the extensive prosecution history of this application, and the seemingly incessant cycle of the Office asserting references and then withdrawing them, is proof that no prima facie case of unpatenability has ever been established.

Applicant notes the Office Action admits "Roche does not teach a pressure in the range of 200 Torr to 760 Torr or more specifically about 200 torr --as further limited by instant claim 38. *If it is thought that these parameters are somehow enabled, then this may be a difference.*" (Office Action at page 8, emphasis added). Applicant respectfully asserts the claimed subject matter is directed to process and method claims. As noted above, Applicant further asserts the Office's discussion of wavelength, with respect to enablement, begins with fundamentally incorrect first principles. The discussion of wavelength is therefore without merit and should be withdrawn. Applicant further asserts the Office's admission that "there may be a difference" is an indication that the Office has

not established a *prima facie* case of obviousness. Withdrawal of the rejections is respectfully requested.

Applicant also notes the Office mistakenly asserts Roche teaches "illuminating the reaction volume of gas 25 from a high intensity light source . . . without illuminating the substrate (col. 2, lines 17-32)". Roche teaches at col. 2, lines 17-32 that a window "maintains the *infrared light source in isolation* from the wafers and donor gases." (Roche at col. 2, lines 17-32, emphases added).

Regarding the first criterion, the Office admits that Roche teaches a pressure of about 8 Torr, and further admits that a higher pressure "may be a difference" with respect to patentability. The Office Action next looks to Hisanume to fill in the deficiencies of Roche. But Hisanume deals exclusively with a temperature regime at or below 400° C.

The Office next uses Bowen to assert inherency. Where inherency is relied upon to establish an element or characteristic of the claimed invention in a reference, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent element or characteristic necessarily flows from the teachings of the applied prior art. *Ex parte Levy*, 17 USPQ2d 1461, 1464 (B.P.A.I 1990); *Atlas Powder Co. v. Ireco, Inc.*, 51 USPQ2d 1943, 1946, 1947 (Fed. Cir. 1999) (emphasis added). A retrospective view of inherency is not a substitute for the required teaching or motivation to combine references that supports the selection and use of the various elements in the references to arrive at the claimed invention. *In re Newell*, 13 USPQ2d 1248, 1250 (Fed. Cir. 1989). Further, the mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency. *In re Rijckaert*, 28 USPQ2d 1955, 1957 (Fed Cir. 1993). Moreover, that which may be inherent is not necessarily obvious because that which may be inherent may not be known, and obviousness cannot be predicated on what is unknown. *Id.* (citing *In re Spormann*, 150 USPQ 449, 452 (CCPA 1966)). Because the Office's assertion of inherency is improper, withdrawal of the rejection is respectfully requested.

Applicant notes Bowen is totally devoid of any teaching regarding the temperatures of his process. Even if one were to set aside the impropriety of asserting inherency, there remains no motivation to combine Bowen with Roche and Hisanume

absent use of Applicant's disclosure as a guide. Withdrawal of the rejection is respectfully requested.

Regarding the second criterion, the reasonable expectation of success to achieve a consistent teaching of the claimed subject matter, Roche and Hisanume teach disparate temperatures and pressures, and Bowen fails to teach a temperature and a pressure of 0.1 atmospheres, which Bowen regards to be "relatively high". (Bowen at column 9, lines 22-30). Roche therefore teaches a high temperature and a low pressure. Hisanume on the other hand teaches a low temperature and only a vague "normal pressure or less" that is not an enabling reference. And Bowen is devoid of temperature teachings, and teaches 0.1 atmospheres as "relatively high." The expectation of success to combine Roche and Hisanume, and to appeal to Bowen for inherency to teach the claimed subject matter therefore comes from Applicant's disclosure. Withdrawal of the rejection is respectfully requested.

With respect to the third criterion, Applicant respectfully asserts all the claims limitations are not taught in the combination of Roche, Hisanume, and Bowen. The Office has pieced together a mosaic of references that taken together fail to teach or suggest the claimed subject matter as a whole, let alone the claims limitations. Withdrawal of the rejections is respectfully requested.

Regarding the rejection of claims 31, 42, 51, and 52, the Office admits Roche does not teach using ozone as the oxygen source or TEOS as the SiO<sub>2</sub> precursor. (Office Action at page 9). The Office then appeals to Hisanume to cover the deficit in Roche. As asserted above, it is improper to combine Roche with Hisanume using Applicant's disclosure as a guide. Withdrawal of the rejections is respectfully requested.

Regarding the rejection of claims 40, 42, and 52, the Office admits Roche does not teach a dopant. (Office Action at page 10). The Office then appeals to Hisanume to cover the deficit in Roche. As asserted above, it is improper to combine Roche with Hisanume using Applicant's disclosure as a guide. Withdrawal of the rejections is respectfully requested.

Regarding the rejection of claims 51 and 52, the Office admits Roche does not teach the use of a mercury arc vapor lamp. (Office Action at page 10). The Office again

indicates a failure to establish a *prima facie* case of obviousness, by suggesting "[i]f it is believed that the use of this light source is enabled for the pressure range of 200 Torr to 760 Torr, then this may be a difference." (Office Action at page 10). As noted above, Applicant further asserts the Office's discussion of wavelength, with respect to enablement, begins with fundamentally incorrect first principles. The discussion of wavelength is therefore without merit and should be withdrawn. Applicant further asserts the Office's admission that "there may be a difference" is an indication that the Office has not established a *prima facie* case of obviousness. Withdrawal of the rejections is respectfully requested.

The Office then appeals to Hisanume to cover the deficit in Roche. As asserted above, it is improper to combine Roche with Hisanume using Applicant's disclosure as a guide. Withdrawal of the rejections is respectfully requested.

Claim 35 was rejected under 35 USC § 103(a) as being unpatentable over Roche in view of Hisanume and considered with Bowen et al. as applied to claim 31 above, and further in view of Takabayashi (U.S. Patent No. 5,112,647). Applicant respectfully traverses this rejection and requests the Office to consider the following.

The impropriety of combination of Roche with Hisanume and Bowen, as set forth above, is incorporated herein by reference. The Office Action admits Roche in view of Hisanume fails to teach "that helium gas may be the carrier gas." (Office Action at page 11). The Office Action next appeals to Takabayashi to fill this deficit. Takabayashi has to do with formation of amorphous silicon. This composition lies outside the claimed subject matter. Takabayashi's temperature is "in general . . . between 30° C and 450° C." This temperature lies outside the claimed subject matter. Combined with Takabayashi's composition, his teaching of temperature at best teaches away from the claimed subject matter. Takabayashi's pressure is referred to as "vacuum" and specified as  $1 \times 10^{-2}$  to  $1 \times 10^2$  Torr. This pressure lies outside the claimed subject matter. Combined with Takabayashi's temperature and composition, his teaching of pressure at best teaches away from the claimed subject matter.

Applicant respectfully asserts that the combination of Roche with Hisanume, Bowen, and Takabayashi, fails to teach or suggest the claimed subject matter. Further, Applicant respectfully asserts that the combination of Roche with Hisanume, Bowen, and Takabayashi, fails to teach or suggest a reasonable expectation of success. Finally, Applicant respectfully asserts that the combination of Roche with Hisanume, Bowen, and Takabayashi, fails to teach or suggest all the claims limitations. Withdrawal of the rejection is respectfully requested.

Claim 36 was rejected under 35 USC § 103(a) as being unpatentable over Roche in view of Hisanume and considered with Bowen et al. as applied to claim 31 above, and further in view of Sato et al. (U.S. Patent No. 5,605,867). Applicant respectfully traverses this rejection and requests the Office to consider the following.

The impropriety of combination of Roche with Hisanume and Bowen, as set forth above, is incorporated herein by reference. The Office Action admits Roche in view of Hisanume fails to specify "the amount of ozone used in the deposition of the SiO<sub>2</sub> film." (Office Action at page 12), and specifically that "Hisanume is silent to the amount of ozone, such that one of ordinary skill would have to determine how much to add . . ." (Office Action at page 12). The Office Action next appeals to Sato to fill this deficit.

Sato has many deficiencies that cannot be reconciled by appeal back to any or all of Roche, Hisanume, and Bowen. One deficiency is that Sato only mentions in passing that "light enhanced CVD may be equally used." (Sato at column 38, line 3). As there is no discussion of how his process would or could be altered, in processing parameters or in processing results, this is not an enabling teaching. Another deficiency is that Sato's temperatures are uniformly below the claimed subject matter. If one were to combine these low temperatures with his passing comment that one may use light enhanced CVD, the failure to produce an enabling teaching becomes more pronounced. When one combines Sato with Roche, Hisanume, and Bowen, there is no motivation to combine these teachings absent using Applicant's disclosure as a guide. Withdrawal of the rejection is respectfully requested.

Claims 1, 2, 4-6, 41, 43-50, 53, and 54 were rejected under 35 USC § 103(a) as being unpatentable over Roche in view of Hisanume and considered with Bowen et al., and further in view of Imai et al. (EP 0562 625 A2). Applicant respectfully traverses this rejection and requests the Office to consider the following.

The impropriety of combination of Roche with Hisanume and Bowen, as set forth above, is incorporated herein by reference. The Office Action admits Roche in view of Hisanume and considered with Bowen does not disclose "at least two dopant sources, etc." (Office Action at page 13) Imai is primarily concerned with reflow after the CVD process. Imai's CVD process, however, is carried out at a pressure of about 350° C (Imai at page 6), which temperature trends away from his representation of a "conventional deposition" of "somewhere between 350 and 450 °C." (Ibid.). Consequently, Imai lends nothing to Roche in view of Hisanume and considered with Bowen, to repair the deficiencies that exist in this mosaic of references. Further, Applicant can find no teaching of pressure in Imai.

Applicant therefore respectfully asserts the motivation to combine Imai with Roche in view of Hisanume and considered with Bowen, to come only from Applicant's disclosure. Applicant also considers, in view of Imai's teaching away from the process temperatures of the claimed subject matter, that there is no reasonable expectation of success, absent the use of Applicant's disclosure as a guide. Finally, with the mosaic of references assembled in the Office Action, Applicant respectfully contends all the claims limitations are not taught. Withdrawal of the rejections is respectfully requested.

## CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney, John Greaves, at (801) 278-9171 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, P.O.Box 1450, Alexandria, VA 22313-1450, on this 24th day of June, 2003.

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